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Cabinet ("Natural Resources Cabinet") a statement of environmental compatibility for the proposed Gilbert unit. By letter dated May 23, 2001, the Natural Resources Cabinet
Appendix D, Cont.

reported that East Kentucky's proposed Gilbert plant will be environmentally compatible.
East Kentucky determined that additional power will be needed to meet its future load requirements and it issued a request for proposal to utilities and power marketers on January 11, 2001. Several responses were received, but East Kentucky's analysis shows that the proposed Gilbert unit will have the lowest cost. Additional analyses were performed in response to the request of the AG. One of those analyses shows that adding one 93 MW combined cycle unit in April 2004 and waiting for the KPE project to develop will cost $114 million less than adding the Gilbert unit now and then relying on the KPE development. East Kentucky rejected this scenario, claiming that it should not place all of its new base load requirements at market risk, contingent on the development of the KPE project as a commercially viable plant.
The AG recommends that East Kentucky's request to construct the Gilbert unit be granted. However, if KPE achieves financial closure by the summer of 2002, the AG suggests that the Commission and the parties explore cancellation of the Gilbert unit.
DOE recommends that East Kentucky should complete a full and comprehensive study of the technical potential of demand-side resources and distributed generation in its service territory before proceeding to construct any new generation.
Based on East Kentucky's supply analyses, the uncertainty of the KPE project, and East Kentucky's need for additional power, the Commission finds that the construction of the Gilbert unit should be approved. Further, the Commission finds that when the KPE project achieves financial closure, East Kentucky should refile the power purchase agreement for review and approval by the Commission. The filing should include an analysis of the feasibility of the cancellation of the Gilbert unit and the substitution of a 93 MW combined cycle unit. In addition, the Commission finds that East Kentucky should continue to review the feasibility of demand side resources and provide a detailed analysis of its review in future filings related to generating capacity.
The Gilbert unit has the ability to burn not only coal but also wood waste and other biomass products due to the nature of a circulating fluid bed boiler. East Kentucky did not propose to include as part of the initial construction the handling facilities necessary to burn any of these other products. The AG recommended that the wood waste handling facilities be included in the unit design and that wood waste be.-4-considered as one of the primary fuels. East Kentucky acknowledged that the wood waste handling facilities would cost $2.5 to $3 million and have a relatively short payback. Due to the potential cost savings over time from burning biomass, the Commission finds that East Kentucky should conduct a detailed analysis of fueling the Gilbert unit with wood waste and other biomass products.
East Kentucky indicated that additional transmission facilities would be needed to maintain stability of the unit at the Spurlock station. A transmission line will be needed to connect to transmission facilities owned by Cinergy Corp. East Kentucky indicated that certain agreements are necessary between the utilities, and additional time will be needed to finalize those agreements. Because of the potential delay in finalizing the transmission agreements, East Kentucky proposed to delete the transmission portion of its application and proceed only with the proposed generating facilities. The Commission finds East Kentucky's proposal to be reasonable.
IT IS THEREFORE ORDERED that:
1. East Kentucky is granted a Certificate of Public Convenience and Necessity and a Certificate of Environmental Compatibility to construct the Gilbert unit, a 268 MW coal-fired generating unit with a circulating fluid bed boiler, at the Spurlock station at an estimated cost of $367 million.
2. East Kentucky shall conduct a detailed analysis of the benefits of fueling with wood waste and other biomass products and file that analysis upon completion.
3. East Kentucky's request to delete from consideration at this time the construction of needed transmission facilities is granted. Within 30 days of completing all analyses, including the selection of a final route for the transmission facilities and the.execution of all necessary agreements with other utilities, East Kentucky shall file a new

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application for approval of the proposed transmission facilities.
Done at Frankfort, Kentucky, this 26 th day of September, 2001.
By the Commission

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Appendix E

APPLICATION OF BGL GASIFICATION
OF SOLID HYDROCARBONS FOR
IGCC POWER GENERATION
2000 Gasification Technologies Conference
San Francisco, California
October 8-11, 2000
Presented by:
GLOBAL ENERGY INC.
Richard A. Olliver
With support from:
GENERAL ELECTRIC POWER SYSTEMS
John M. Wainwright
PRAXAIR
Raymond F. Drnevich.2

ABSTRACT

Since last year's GTC Conference, a considerable number of significant events have occurred in the gasification technology marketplace. New IGCC projects have come on stream with commercial operation, other new IGCC projects have been announced and started in development, environmental issues have gained emphasis, and energy prices, notably natural gas, have escalated dramatically. Directionally, all of these events appear to have created a more favorable atmosphere for IGCC projects.

Related to an ongoing IGCC project currently in development, a joint analysis has been performed by Global Energy, General Electric Power Systems, and Praxair to evaluate technical and economic elements for the performance of BGL Gasification Technology based on solid hydrocarbon fuel feed to an IGCC for power generation.

Results of the analysis provide a picture of the relative economics in today's environment for electrical power generation by conventional natural gas fired combined cycle power systems compared to using BGL Gasification Technology in an IGCC configuration..3

INTRODUCTION

Over the last few years there have been a number of new Integrated Gasification Combined Cycle (IGCC) plants placed in operation, under construction, or otherwise in development, representing numerous technologies and fuel applications. Typically, the new IGCC plants have utilized either solid or liquid hydrocarbons as feed, gasification methods including entrained flow, fixed bed or fluid bed technologies, and power blocks utilizing various gas turbine systems

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and manufacturers.

Global Energy has several commercial IGCC projects under development based on using BGL Gasification Technology to gasify solid hydrocarbons for power production. Coincident with these development efforts, several feasibility studies have been performed related to diverse applications of the BGL Gasification Technology. This paper deals with the application of BGL Gasification Technology fueled with coal and incorporating an Oxygen plant provided by Praxair and a Power Island using 7FA Gas Turbines provided by General Electric Power Systems.

MACRO-ECONOMIC BACKGROUND

The original concept for performing this particular analysis evolved from ongoing technical analyses and business discussions related to several IGCC projects currently in development by Global Energy. The origins of these projects considered site issues and microeconomics of project specifics; additionally Global Energy kept an eye on the fundamental macroeconomic issues that were driving the IGCC industry and furthering its growth.

The interesting event that occurred at the inception of this analysis was the dramatic increase in energy prices this year, notably in prices for electrical power and natural gas. Accordingly, the analysis shifted its focus to consider the position of BGL Gasification Technology in the IGCC industry, the economic status of a commercial BGL based IGCC relative to power from natural gas, and a consideration of other factors of note in the rapidly changing world of energy prices.

BASIS FOR ANALYSIS

For purposes of this analysis, a single design case was developed and analyzed for the BGL Gasification Technology application, essentially considering use of Pittsburgh # 8 coal as the solid hydrocarbon feed to the Gasification Island..4

OVERALL IGCC CONFIGURATION

As shown in Attachment C, the overall project configuration includes the Gasification Island, comprised of the BGL gasification units, ASU, and syngas cooling and cleanup units, and the Power Island, which consists of two General Electric 7FA gas turbine generators and HRSGs and one steam turbine, all optimized for firing on syngas, but capable of operation on natural gas. At site design, ambient conditions of 59°F, 14.28 psia and 60% RH, Gross and Net Electrical Power Output are approximately 586MW and 538MW, respectively, and Net Heat Rate is 8072 BTU/KWh, HHV. Plant capital cost is assumed to be $1000/KW. The plant includes normal offsites, utilities and infrastructure required to support the main operating units.

GASIFICATION ISLAND

As shown in Attachment D, the BGL Gasification process is a fixed bed type gasifier that uses a lock hopper system to admit dry feed to the pressurized reaction vessel. The gasifier units are refractory lined and water jacket cooled. As the feedstock descends it is heated by rising high temperature gases. Moisture and volatile light hydrocarbons leave the coal soon after the feed

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enters the gasifier unit and exit the gasifier with the syngas stream. Oxygen and steam are injected near the bottom of the unit and react with devolatilized coal to provide thermal energy needed for the formation of syngas components. The high temperature also converts the inert ash content of the coal into vitreous frit or slag.

The vitreous frit is removed from the bottom of the gasifier via a lock hopper and is water quenched, thus capturing the inorganic content of the feedstock as a glassy silica matrix material resembling coarse sand. The vitreous frit is an environmentally benign synthetic aggregate material suitable for use as roadway base, roofing material and seawall construction.

The BGL Gasification IGCC system offers the following features:

- High gasification efficiency (carbon conversion), typically over 92%,
- Use of run-of-the-mine coal or other carbon-based feedstock,
- High thermal efficiency and simple heat exchanger for convenient heat recovery,
- High gasifier throughputs,
- Superior environmental performance, and
- A closed loop system with no primary stack and no ash residue.

The synthesis gas produced in this process is made up primarily of carbon monoxide and hydrogen (more than 85% by volume), and smaller quantities of carbon dioxide and methane..5 Hot syngas leaving the top of the gasifier is quenched and purified. Particulates and other impurities are removed in this initial gas processing stage. Heavier oils and tars will condense during cooling, and are returned to the gasifiers for reflux into the hearth zone.

Sulfur compounds in the feedstock are converted mainly to H2S and smaller quantities of COS in the raw syngas. Over 99% of these are removed through acid gas cleanup and sulfur recovery units prior to combustion in the gas turbines, resulting in exceptionally low SO2 emissions. The acid gas cleanup is accomplished using a selective solvent; the sulfur recovery is accomplished with the use of a process unit employing the Claus reaction to generate elemental sulfur. The elemental sulfur in these compounds is a commercially saleable product.

POWER ISLAND

The Power Island is based on a configuration of two trains of dual-fuel General Electric 7FA gas turbines with hydrogen-cooled generators. Each train is coupled to its own Heat Recovery Steam Generator (HRSG), which together will provide superheated steam for a single steam turbine generator. The system enables transfer to natural gas should syngas flow be interrupted. This provides for Power Island availability equal to that of conventional natural gas fired power plants.

Prior to entering the gas turbine combustor, the syngas is saturated with water and is then superheated. Additionally, nitrogen from the ASU is moisturized, superheated, and injected into